
FACULTY OF ENGINEERING, SCIENCE AND THE BUILT ENVIRONMENT

Unit title:	Energy Resources, Utilisation and Economics
Unit number:	DEG/M/124
Unit value:	1.0
Unit co-ordinator:	A R Day
Contact time:	45 hours
Private study time:	105
Unit pre-requisites:	None

INTRODUCTION

The unit examines the influences on energy supply systems including the economics of delivery, environmental impacts, energy markets and government policy. The need for secure and affordable supplies often conflicts with environmental and social considerations, and the scope for innovation and change in a particular energy system will depend on a large number of factors which are often difficult to evaluate. By looking at particular market drivers and policy instruments, and the potential to model (national or regional) energy systems, the unit provides a perspective on how new and emerging technologies can fit into the global picture.

AIMS OF THE UNIT

- To review the role of national energy policies in terms of environmental, economic and social criteria.
- To examine the operation of energy markets
- To analyse the roles of subsidies, regulation and market interventions
- To appraise to way energy systems are analysed and modelled

LEARNING OUTCOMES

At the end of this unit the student should be able to:

- Evaluate the need for an environmental dimension to energy policy.
- Understand the operation of emissions trading schemes and other instruments.
- Analyse the relationships between such instruments, and their potential effects on energy systems.
- Identify the different modelling approaches to energy systems and assess their different roles.

THE PROGRAMME OF TEACHING, LEARNING AND ASSESSMENT

INDICATIVE CONTENT

In this unit you will be expected to develop a strong appreciation of national and global energy systems and how the various policy drivers are turned into practical instruments to influence change. The lecture programme is designed to introduce the main concepts, but deeper insights will be gained through the coursework assignment and self study. The coursework brief is introduced at an early stage, and it will be necessary to start research at the outset. The issues covered by the coursework are complex, and it will take some weeks to assimilate the diverse and often difficult primary material.

It is important to produce a final report that is properly structured and fully referenced. It is not sufficient to assemble a collection of official sources of information, but to synthesise this information and provide an in-depth analysis of the prevailing situation. You are strongly advised to attend the whole lecture programme, as all of the issues covered impact (to a greater or lesser degree) on the final report. There will be time each week to discuss progress of the assignment, and to assist with information gathering and analysis.

Energy and Environment

An introduction to the principles of climate change, and political developments aimed at mitigation (e.g. Kyoto agreement and government targets). Local and global environmental impacts from different technologies including fossil fuels, nuclear and renewables. The tension between the environmentalist and the economist perspectives. Typical consumption split by fuel and by sector at a national and international level.

Fossil fuel resources

Hubbert and Gompertz models for assessment of finite resources. The difference between reserves and resources and the relationship of demand to recovery of fossil fuels.

The markets for oil, gas and coal. Geographical perspective on resource deposits and exploration activities.

The role of renewable energy technologies

Solar thermal, wind power, wave and tidal energy, biofuels, geothermal energy, refuse derived fuels (methane and solid waste), photovoltaics. Potential contributions, environmental impacts, technical and institutional constraints.

Cost analysis and the need for energy subsidies.

Energy markets and energy policy

Structure of the electricity market, and trading and pricing mechanisms.

Government energy policy, current legislation and future frameworks.

Controlling of emissions through regulation and fiscal measures, e.g. taxes, levies or tradeable permits. Encouragement of new technology through subsidy, regulation or market stimulation.

Modelling of energy systems

Modelling of future supply mixes and demand patterns using MARKAL and similar tools, and the sensitivity of forecasts to assumptions about the market. The use of scenarios in policy development.

The use of system dynamics to evaluate market development of new technologies.

ASSESSMENT PROGRAMME

The assessment will be through one written assignment. There will be a staged assessment in week 5 to review progress on literature gathering and planning of the final report. The assessment weightings will be.

Stage 1, review of literature and plan of work	30%
Stage 2, final report	70%

LEARNER SUPPORT MATERIALS

Useful websites include those for:

The Department of Trade and Industry – www.dti.gov.uk

The Department for the Environment, Food and Rural Affairs – www.defra.gov.uk

The Office of Gas and Electricity Markets – www.ofgem.gov.uk

INDICATIVE SOURCES

Core

RENEW, the newsletter of the Network for Alternative Technology and Technology Assessment (NATTA), a bimonthly publication with information and views on the energy supply industry in the UK. Student subscriptions (low cost!) available from NATTA c/o Energy and Environment Research Unit, Faculty of Technology, The Open University, Walton Hall, Milton Keynes Bucks, MK7 6AA.

E-mail <s.j.dougan@open.ac.uk>. A reduced online version can be found at <http://www-tec.open.ac.uk/eeru>.

Broadsheet newspapers and radio and television news carry items about energy related issues almost daily.

Energy Papers are published by Government on a wide range of energy issues. Many energy related documents can be found on the DTI, DEFRA and OFGEM websites.

Recommended

Nakioenovic, Grubler and McDonald, Global Energy Perspectives, Cambridge University Press, 1998. ISBN 0-521-64569-7

Cassidy, E.S. and Grossman, P. Z., Introduction to Energy: Resources, Technology and Society, Cambridge University Press, 1990

Renewable Energy: Sources for Fuels and Electricity, Edited by Thomas B. Johansson, Henry Kelly, Amulya K. N. Reddy and Robert H. Williams, Earthscan, Island Press, 1993

Patterson, W., Transforming Electricity, Earthscan, 1999.

Optional

Boyle, G (ed), Renewable Energy: Power for a Sustainable Future, Oxford University Press, 1996

Cairncross, F., Costing the Earth, Harvard Business School Press, 1992.

Digest of UK Energy Statistics, Department of Trade and Industry, Published annually and available from www.dti.gov.uk/inform/dukes/index.htm

Toke, D, The Low Cost Planet, Pluto, 1995

World Energy Council, Energy for Tomorrow's World, Kogan Page 1993.